2005 Shutdown (WBS 2.2)

Peter H. Garbincius

Overview of 2005 Shutdown

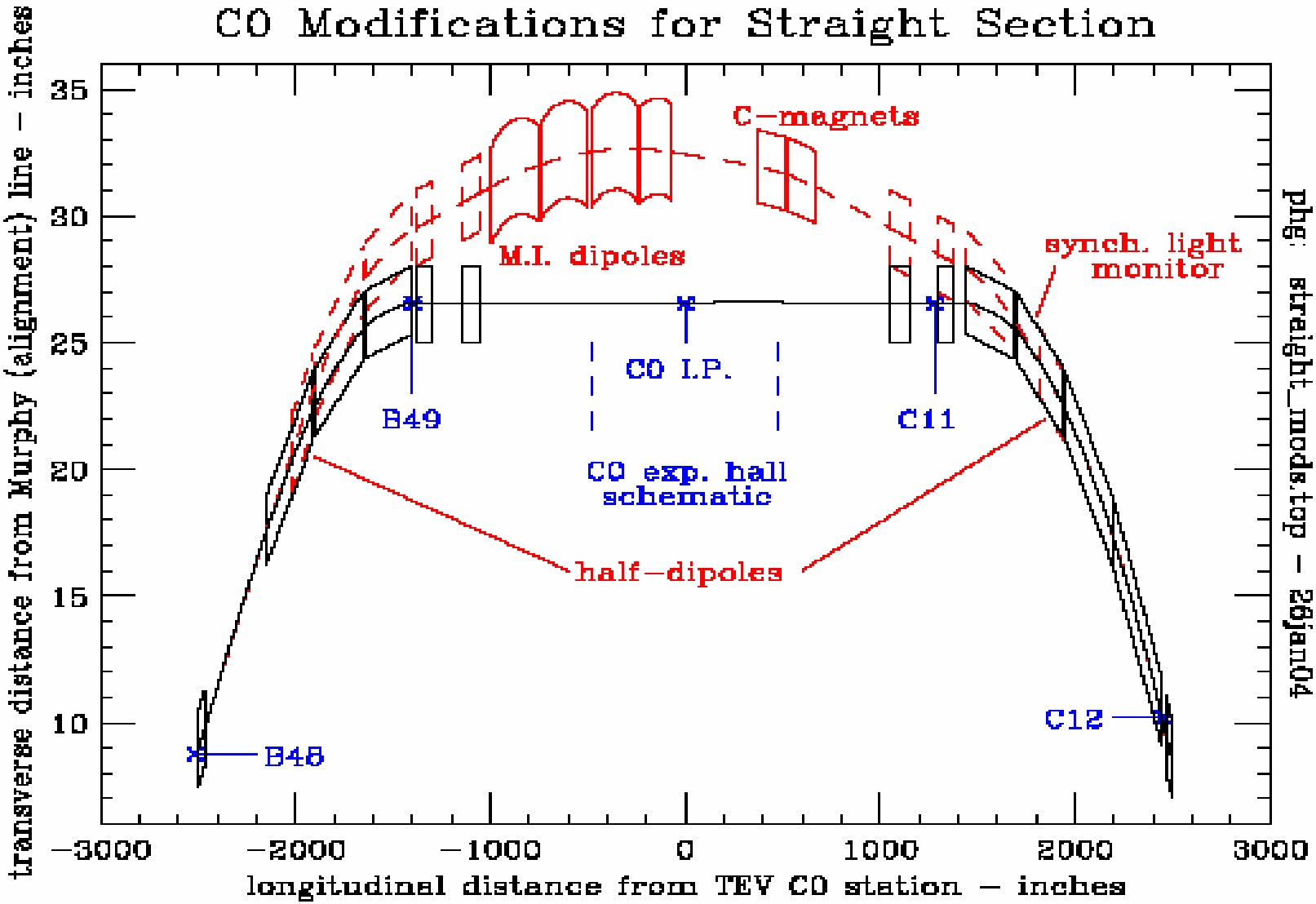
- Implement a normal long straight section in the Tevatron at C0 for the installation, testing, and commissioning of BTeV components – reconfigure bends, but no optics change.

- Modify existing Main Ring LCW (low conductivity cooling water) system to cool BTeV's SM3 analysis magnet, B2 compensating dipoles, and muon toroid magnets, both in experimental hall and during testing in assembly hall.

- With exception of Synchrotron Light Monitor, exactly the same tasks were accomplished during 1997-1999 and January 2003 shutdowns with same personnel => little risk!

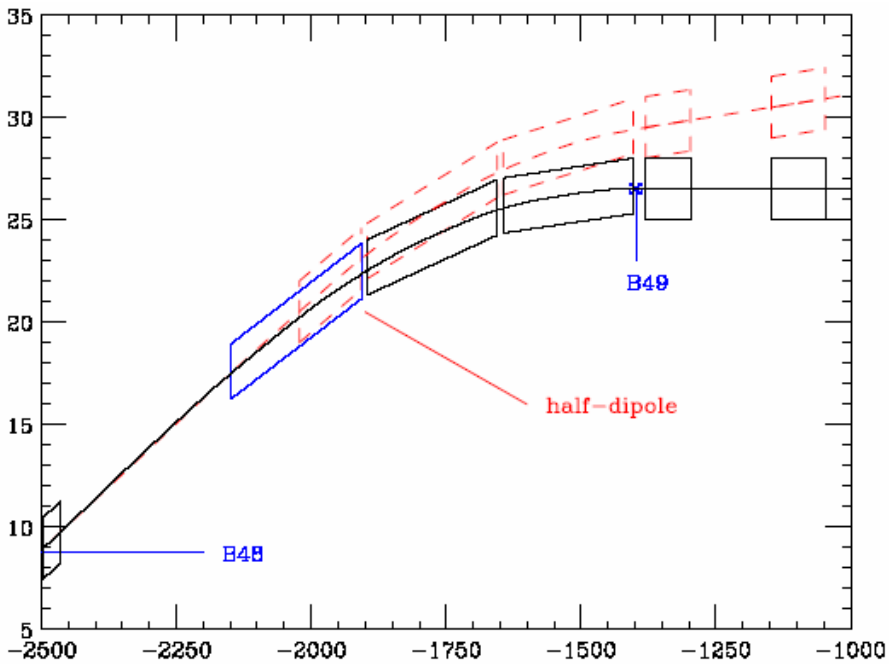
C0 Experimental Hall – showing abort elements - 1999 and 2003 Main Injector dipoles (insert)

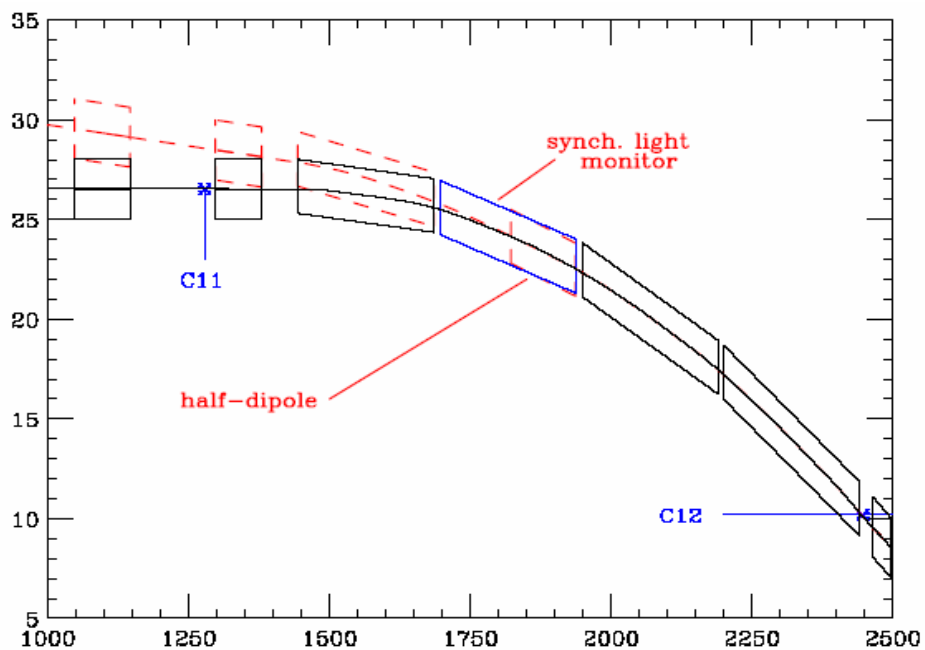
C0 Modifications for Straight Section



Zoom-in on modifications

- Remove remnants of Fixed Target abort: 3 Main Injector dipoles, 2 C-magnets, 2 half-length Tevatron dipoles, & Synchrotron Light monitor
- Replace with 2 full-length dipoles & beam pipe
- Re-align components, maximum transverse move ~ 4.2 inches (inward)
- Orbit length reduced by 1.6 mm => $\Delta f = 13$ Hz, $\Delta p = 13$ MeV, this reduces part of 39 mm mis-match with Main Injector ring





Organization

WBS 2.2 – 2005 Shutdown – P. Garbincius

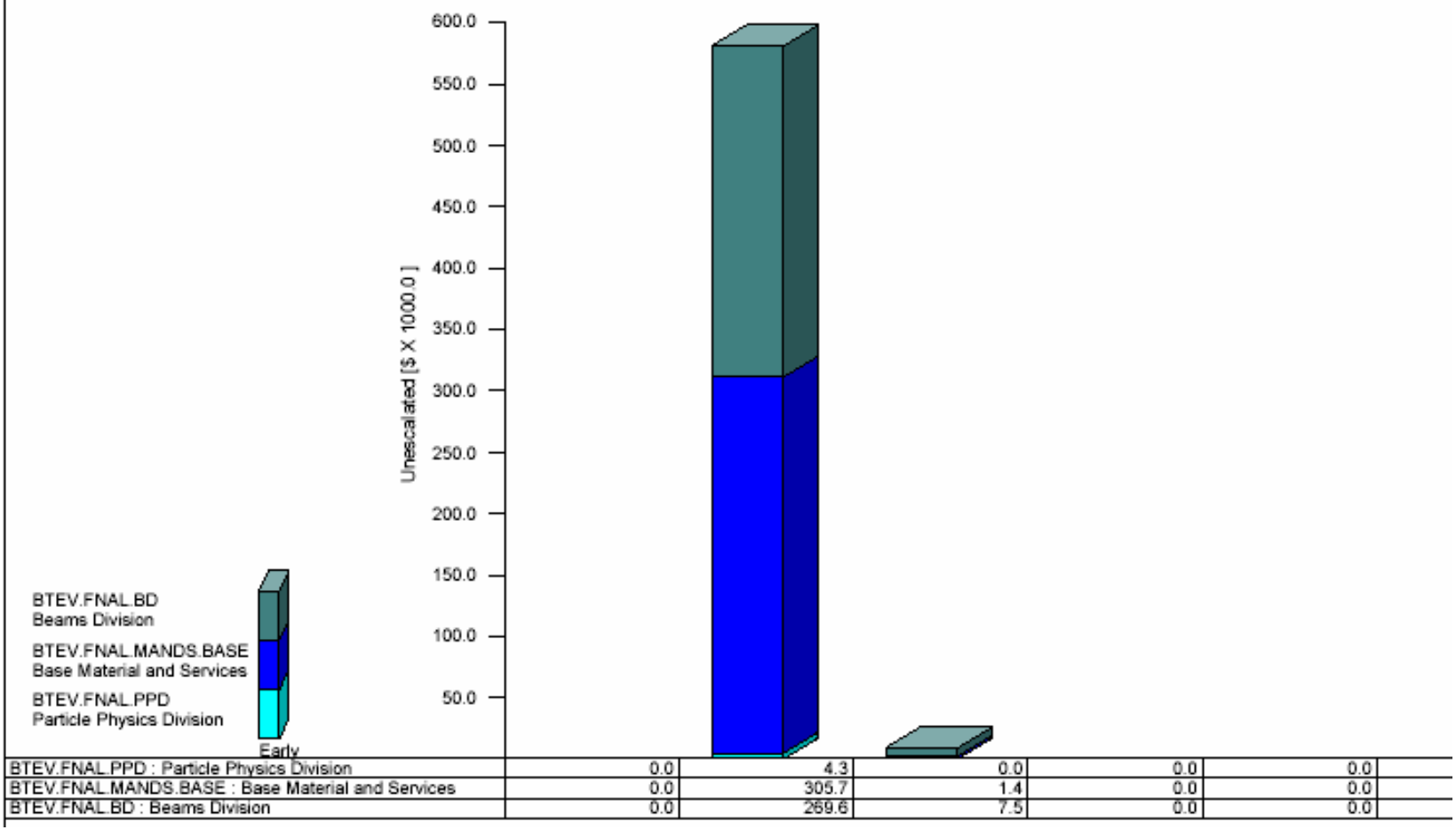
- 2.2.1 – Planning, Coordination, Fabrication – P. Garbincius
- 2.2.2 – Device Removal and Installation – R. Reilly
- 2.2.3 – LCW Modifications – J. Riordan
- 2.2.4 – Controls & Instrumentation Mods – S. Lackey & RT-K
- 2.2.5 – Cryogenic Modifications – J. Theilacker
- 2.2.6 – Magnet Purchase – P. Garbincius
- 2.2.7 – Vacuum Modifications – R. Reilly
- 2.2.8 – Install Synch Light Monitors – R. Thurman-Keup
- 2.2.9 – Commissioning – G. Annala

Construction Obligation Breakdown WBS 2.2

WBS	Subproject	M&S (K$)	labor (K$)	total (K$)
2.2.1	Planning and fabrication	94.8	108.6	203.4
2.2.2	Device removal and installation	137.1	66.4	203.5
2.2.3	LCW modifications	72.5	25.1	97.6
2.2.4	Controls and instrumentation	2.8	8.7	11.5
2.2.5	Cryogenic modfications	0.0	27.0	27.0
2.2.6	Magnet purchase	0.0	0.0	0.0
2.2.7	vacuum modifications	0.0	6.7	6.7
2.2.8	Install synch light @ D4	0.0	33.3	33.3
2.2.9	Commissioning	0.0	8.2	8.2
	Total	**307.2**	**284.0**	**591.2**

Total Obligation Profile by Fiscal Year WBS 2.2

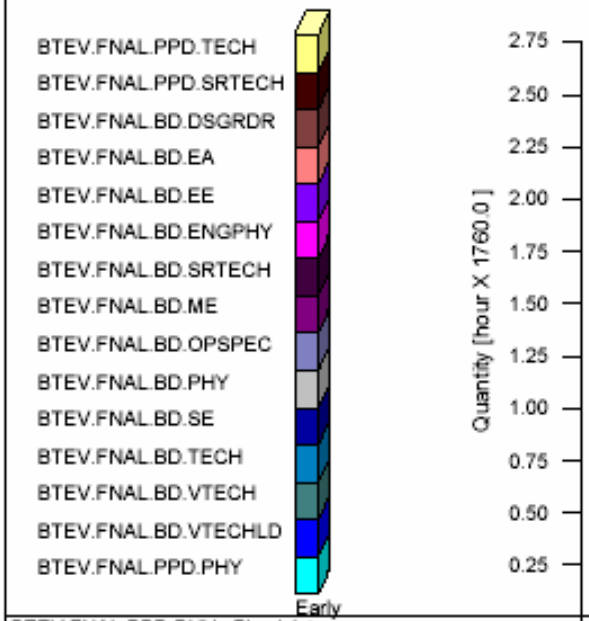
Activity ID	Activity Description	FY04	FY05	FY06	FY07	FY08
2	2005 shutdown		2			



BTEV.FNAL.PPD : Particle Physics Division	0.0	4.3	0.0	0.0	0.0
BTEV.FNAL.MANDS.BASE : Base Material and Services	0.0	305.7	1.4	0.0	0.0
BTEV.FNAL.BD : Beams Division	0.0	269.6	7.5	0.0	0.0

Labor Profile by Fiscal Year (FTE's) WBS 2.2

Activity ID	Activity Description	FY04	FY05	FY06	FY07	FY08
2	2005 shutdown		2			



BTEV.FNAL.PPD.PHY : Physicist	0.0	0.1	0.0	0.0	
BTEV.FNAL.BD.VTECHLD : Vacuum Technician Leader	0.0	0.1	0.0	0.0	
BTEV.FNAL.BD.VTECH : Vacuum Technician	0.0	0.3	0.0	0.0	
BTEV.FNAL.BD.TECH : Technician	0.0	0.3	0.0	0.0	
BTEV.FNAL.BD.SE : Software Engineer	0.0	0.1	0.0	0.0	
BTEV.FNAL.BD.PHY : Physicist	0.0	0.3	0.0	0.0	
BTEV.FNAL.BD.OPSPEC : Operations Specialist	0.0	0.0	0.0	0.0	
BTEV.FNAL.BD.ME : Mechanical Engineer	0.0	0.5	0.0	0.0	
BTEV.FNAL.BD.SRTECH : Senior Technician	0.0	0.5	0.0	0.0	
BTEV.FNAL.BD.ENGPHY : Engineering Physicist	0.0	0.3	0.0	0.0	
BTEV.FNAL.BD.EE : Electrical Engineer	0.0	0.1	0.0	0.0	
BTEV.FNAL.BD.EA : Engineering Associate	0.0	0.0	0.0	0.0	
BTEV.FNAL.BD.DSGRDR : Designer/Drafter	0.0	0.0	0.0	0.0	
BTEV.FNAL.PPD.SRTECH : Senior Technician	0.0	0.0	0.0	0.0	
BTEV.FNAL.PPD.TECH : Technician	0.0	0.0	0.0	0.0	

Schedule WBS 2.2

Activity ID	Activity Description	FY05
2	2005 shutdown	2
2.1	Planning, coordination, fabrication	2.1
2.2	Device removal and installation @ B4,C0,C1	2.2
2.3	LCW modifications	2.3
2.4	Controls and instrumentation modifications	2.4
2.5	Cryogenic modifications @B4 and C1	2.5
2.6	Magnet purchase	2.6
2.7	Vacuum modifications	2.7
2.8	Install synch light monitors @ D4	2.8
2.9	Commissioning	2.9

Project Flow for implementing C0 straight section

- Warm up cryo B4 and C1
- Unhook warm magnets, LCW, vacuum, tray, railings, etc.
- Open 400 ton shield door
- As found alignment check
- Remove 2 C-magnets
- Remove 4 MI dipoles – riggers
- Remove 61 blocks – riggers
- Tunnel isolation walls/doors

C0 Exp Hall outfitting can start

- Undo 17 cryo interfaces
- Remove 2 Tevatron half-dipoles, and 2 warm bypasses
- Reposition 3 cryo dipoles, 4 cryo quads, and 6 cryo boxes
- Add 2 full-length Tevatron dipoles and 1 standard cryo bypass
- Rough alignment setting
- Add 2 Beam Position Monitors
- Extend cryo piping - pipefitters
- Make-up 16 cryo interfaces and leak check
- Hookup Tev bus – electricians
- Warm vacuum pipes: install, leak check, bake-out
- Final alignment setting
- Close 400 ton shield door
- Cool down cryo B4 and C1

in parallel with

- LCW mods to BTeV – pipefitters

Prelim. MS Project for 2005 Shutdown – 198 entries

ID	Task Name	Duration	Start	Finish	Predecess
	2005 Shutdown	**52 days**	**Mon 8/22/05**	**Tues 11/1/05**	
871	Install Hillmans and cylinders on each side of door	8 hrs	Mon 8/22/05	Mon 8/22/05	
872	Remove ODH seal from door	4 hrs	Mon 8/22/05	Mon 8/22/05	
873	Move door out	8 hrs	Tue 8/23/05	Tue 8/23/05	871,872
874	vent vacuum C-0 warm	2 hrs	Mon 8/22/05	Mon 8/22/05	
875	Remove Beam Tube from mi dipole to C-magnet BPM and to Tev	4 hrs	Mon 8/22/05	Mon 8/22/05	874
876	disconnect electrical	2 hrs	Mon 8/22/05	Mon 8/22/05	875
877	disconnect water	1 hr	Tue 8/23/05	Tue 8/23/05	876
878	Remove fence B Side	4 hrs	Tue 8/23/05	Tue 8/23/05	877
879	Isolate and drain LCW	10 hrs	Tue 8/23/05	Wed 8/24/05	878
880	Rig 86000 lb forklift into tunnel	10 hrs	Wed 8/24/05	Thu 8/25/05	873
881	Install Air barrierB and C side	4 hrs	Wed 8/24/05	Thu 8/25/05	879
882	Disconnect all MI dipoles	2 hrs	Thu 8/25/05	Thu 8/25/05	881
883	Remove hand rails	4 hrs	Thu 8/25/05	Fri 8/26/05	882
884	1st MI dipole roll into position	2 hrs	Fri 8/26/05	Fri 8/26/05	883
885	1st MI dipole pick up with vehicle and transport	3 hrs	Fri 8/26/05	Fri 8/26/05	884
886	2nd Mi dipole roll into position	2 hrs	Fri 8/26/05	Fri 8/26/05	885
887	2nd mi dipole pick up and transport	3 hrs	Mon 8/29/05	Mon 8/29/05	886
888	3rd mi dipole roll into position	2 hrs	Mon 8/29/05	Mon 8/29/05	887
889	3rd mi dipole pick up and transport	3 hrs	Mon 8/29/05	Mon 8/29/05	888
890	4th dipole roll into position	2 hrs	Tue 8/30/05	Tue 8/30/05	889
891	4th dipole pick up and transport	3 hrs	Tue 8/30/05	Tue 8/30/05	890
892	Transport small fork lift into Tev tunnel	2 hrs	Tue 8/30/05	Tue 8/30/05	891
893	Rig Large fork lift from C-0	10 hrs	Tue 8/30/05	Wed 8/31/05	891
894	Rig Small fork lift into C-0	3 hrs	Wed 8/31/05	Thu 9/1/05	893
895	Remove steel plates from K and C blocks	8 hrs	Thu 9/1/05	Fri 9/2/05	894
896	Remove C blocks 36	1.5 days	Fri 9/2/05	Mon 9/5/05	895
897	Remove 28 K blocks on Tev lower floor	10 hrs	Mon 9/5/05	Tue 9/6/05	896
898	Transport small fork lift from Tev tunnel	3 hrs	Wed 9/7/05	Wed 9/7/05	897
899	Remove 2 C magnets from C side (need magnet vehicle)	6 hrs	Wed 9/7/05	Thu 9/8/05	898

Project: Summer 2003 Shutdown
Date: Mon 4/19/04

Task
Split
Progress
Milestone
Summary
Rolled Up Task
Rolled Up Split
Rolled Up Milestone
Rolled Up Progress
External Tasks
Project Summary
External Milestone
Deadline

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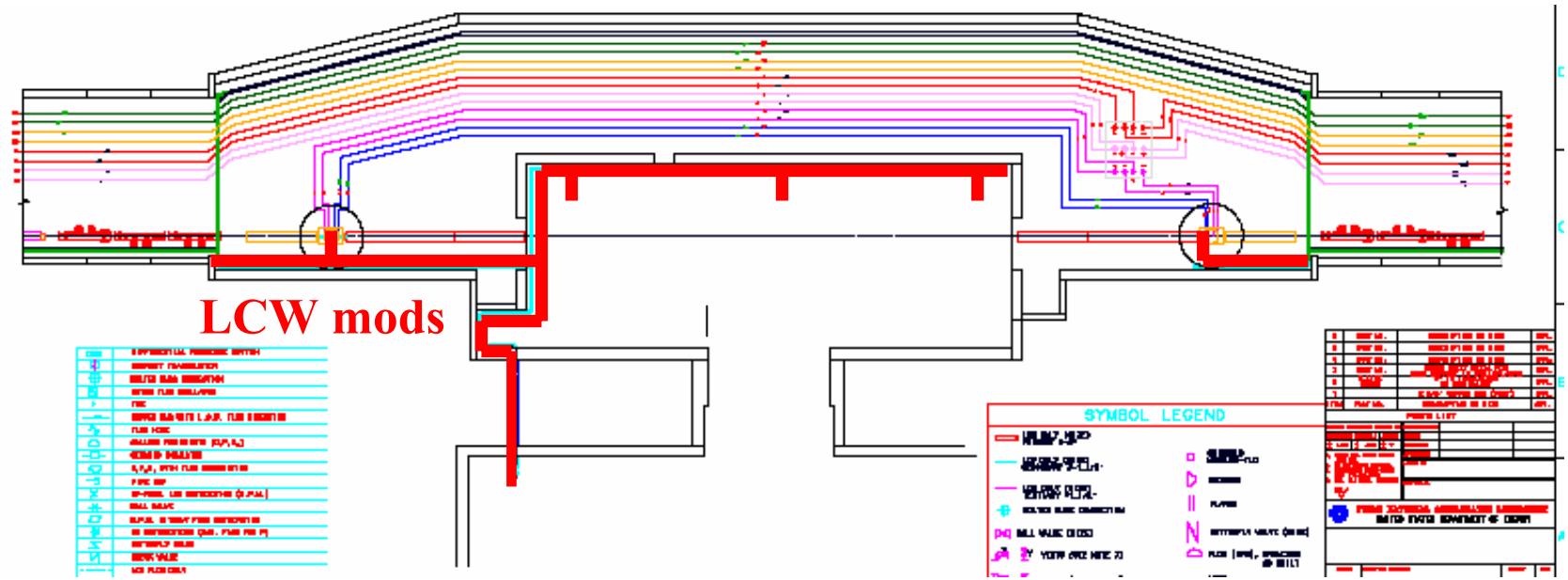
LCW water to BTeV Experiment (2005 shutdown)

- 220 feet of pipe (x2 for feed + return)
- 240 gallons per minute – total for BTeV Experiment
- Installation duration => 34 days - estimate
- BTeV Installation (WBS 1.10) will connect to magnets



- also shows future low-β quad power bus

Key Milestones

- Complete detailed design, procurement, fabrication
  - Vacuum pipes and stands are needed before start of shutdown
  - Similar to installation of M.I. Dipoles in January, 2003
  - Standard unhook, re-connect, leak check of cryogenic elements
- Acquire manpower
  - T&M riggers, ironworkers, electricians, pipefitters, etc.
  - Loaners from other Fermilab Divisions and Sections
  - Need Radiation Worker and ODH Training & Medical Approval
- Synchrotron Light Monitor(s)
  - Find position(s) in Tevatron ring
  - Build a second SL monitor, if needed
  - Modify 32” Cryogenic Quadrupole (and spare), if needed

Critical Paths

- The scheduling of the 2005 shutdown will not be driven by BTeV, but rather by Tevatron operations and maintenance schedules and Run II Luminosity Upgrades. The 8 week shutdown is tentatively scheduled to begin in August, 2005. This will be finalized at least 2 months in advance, which is deemed sufficient preparation, provided that planning, procurement, and fabrication are started early in calendar year 2005. This is standard procedure for scheduling shutdowns.
- Similar worries from 2003 C0 Lambertson change:
  - Vacuum pipes (electropolished and H_2 degassed) and stands
  - Magnet stands (are now available for replacement, if needed)
  - Availability of just-right-size fork lift truck (remove M.I. Dipoles)
  - Training and Medical Qualifications for contract & Fermilab people
- New worry for 2005: Synchrotron Light monitor

Glossary of Terms

- C0, B48, etc. – locations (component address) in Tevatron
- M.I. – Main Injector (one of Fermilab's accelerators)
- LCW – Low conductivity (cooling) water
- ODH – Oxygen Deficiency Hazard
  - ➢ possibility of < 18% O_2 content of atmosphere (normally 21%) due to malfunction of Tevatron cryogenic system
  - ➢ also refers to the steps taken to mitigate the ODH hazard